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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/786,977	06/07/2001	Koji Takahashi	299002052200	7953

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EXAMINER

BROPHY, JAMIE LYNN

ART UNIT PAPER NUMBER

2822

DATE MAILED: 06/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application N .

09/786,977

Applicant(s)

TAKAHASHI ET AL.

Examiner

J. L. Brophy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 April 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 32 and 33 is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

This office action is in response to the amendment filed 4/2/03.

#### ***Claim Objections***

Claims 30-31 are objected to because of the following informalities: in claim 30, line 4, "X" should be deleted. Appropriate correction is required.

Please note that dependent claims are objected to because the claims from which they depend have been objected to.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not provide support for the limitation "without pre-cracking" and one skilled in the relevant art would not necessarily understand that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification at p. 44, line 3 teaches that "NH<sub>3</sub> as the gas source was supplied by performing cracking using alumina". However, the specification does not mention "pre-cracking". Even though it is not necessary for the

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specification to provide literal basis for a negative limitation, examiner contends that the specification does not reasonably convey to one of ordinary skill in the art that the nitrogen source gas is provided "without pre-cracking".

Please note that dependent claims are rejected because the claims from which they depend have been rejected.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1, 10 and 19, the limitation "pre-cracking" is not clear and the specification does not provide clarification. Does "pre-cracking" only encompass decomposition of the nitrogen source before the nitrogen source enters the process chamber? Does "pre-cracking" also include heating the nitrogen source? Does the "pre" in "pre-cracking" indicate that the cracking occurs before entry into the process chamber or that the cracking occurs sometime before the layer is formed?

Please note that dependent claims are rejected because the claims from which they depend have been rejected.

### ***Claim Rejections - 35 USC § 102***

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 9-14, 18-23 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Major et al (5,689,123).

Major et al teach a method for forming a compound semiconductor layer, comprising the step of crystal-growing a group III-V compound semiconductor layer containing at least nitrogen and arsenic as group V elements on a single crystal substrate (Fig. 10 and col. 14, lines 54-58),

Wherein the step of crystal-growing the compound semiconductor layer includes the step of supplying an aluminum source material to the single crystal substrate concurrently with a nitrogen source material or separately from the nitrogen source material (col. 12, lines 42-50) without pre-cracking (col. 12, lines 14-26),

Wherein an aluminum-mix crystal ratio in a group III element in the compound semiconductor layer is 0.02 or higher (col. 14, line 57),

Wherein the step of crystal-growing the compound semiconductor layer is performed at a temperature of the single crystal substrate in the range of 500°C or higher and 750°C or lower (col. 12, lines 58-62),

Wherein the nitrogen source material contains  $\text{NH}_3$  or  $\text{H}_2\text{NNH}_2$  (col. 12, lines 14-26),

Wherein more than 0% and less than 50% of the crystal growth surfaces of the compound semiconductor layer is covered with group V atoms (col. 12, lines 58-59 and col. 13, lines 3-5),

Wherein the compound semiconductor layer further contains indium (col. 13, lines 3-5), and

Wherein a light emitting layer includes the compound semiconductor layer (col. 3, line 59 through col. 4, line 28).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 6-8, 10, 15-17, 19 and 26-28 rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al in view of Major et al.

Sugiura et al teach a method for forming a compound semiconductor layer, comprising the step of crystal-growing a group III-V compound semiconductor layer containing at least nitrogen and arsenic as group V elements on a single crystal substrate, and

Crystal-growing a layer formed of  $Al_hGa_iIn_{1-h-i}As_jP_{1-j}$  on the single crystal substrate, wherein the step of crystal-growing the compound semiconductor layer and the step of growing the crystal formed of  $Al_hGa_iIn_{1-h-i}As_jP_{1-j}$  are performed at the same temperature,

Wherein the step of crystal-growing the compound semiconductor layer is performed before and/or after the step of crystal-growing the layer formed of  $Al_hGa_iIn_{1-h-i}As_jP_{1-j}$ .

See col. 6, lines 55-67 and col. 18, lines 10-14.

However, Sugiura et al do not specifically teach that the step of supplying an aluminum source material to the single crystal substrate may be performed concurrently with or separately from the step of supplying the nitrogen source material without pre-cracking.

Major et al teach a method that comprises supplying an aluminum source material to the single crystal substrate concurrently with or separately from the step of supplying the nitrogen source material (col. 12, lines 42-50) without pre-cracking.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Sugiura et al by supplying an aluminum source material concurrently with or separately from supplying the nitrogen source material in order to form a crystal having desired concentrations of elements (see Major et al, col. 12, lines 37-40).

Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al.

Sugiura et al teach a compound semiconductor apparatus, comprising at least one group III-V compound semiconductor layer containing at least Al as a group III element and containing at least N and As as group V elements (6, line 60),

Wherein the compound semiconductor apparatus is a light emitting device including at least a light emitting layer, and the light emitting layer includes the compound semiconductor layer (col. 1, lines 10-15).

However, Sugiura et al do not specifically teach that the Al-mix crystal ration in the compound semiconductor layer is 0.02-0.20.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to optimize and select an appropriate Al concentration in the compound semiconductor layer. The selection of parameters such as energy, power, concentration, temperature, time, depth, thickness, etc., would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from results of prior art...such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality...More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 105 USPQ 233, 235 (CCPA 1955). See also MPEP 2144.05.

### ***Allowable Subject Matter***

Claims 32 and 33 are allowed.

The following is an examiner's statement of reasons for allowance: none of the references of record teach all of the process limitations as claimed. Specifically, re claims 32 and 33, none of the references teach a device that comprises a light emitting



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layer formed of  $\text{Al}_x\text{Ga}_y\text{In}_{1-x-y}\text{N}_z\text{As}_{1-z}$ , wherein the Al-mix crystal ratio  $x$  in the light emitting layer is between 0.02 and 0.2, in combination with the other claim limitations.

### ***Response to Arguments***

Applicant's arguments filed 4/2/03 have been fully considered but they are not persuasive.

Regarding the added limitation of "without pre-cracking", applicant argues that, even though the specification does not provide literal support for the limitation, lack of literal basis in the specification for a negative limitation may not be sufficient to establish a *prima facie* case for lack of descriptive support. Applicant cites *Ex Parte Parks* and MPEP 2173.05(i). One difference between the *Ex Parte Parks* case and the present application is that, in the *Ex Parte Parks* case, the decomposition in the absence of a catalyst would inherently happen at the claimed temperatures (see *Ex Parte Parks* last paragraph of p. 1236). In the present application, it is not necessary or inherent that the nitrogen source material be supplied without pre-cracking. Therefore, applicant's arguments regarding the lack of descriptive support are not found persuasive.

Depending upon applicant's definition of "pre-cracking", claims 1-5, 9-14, 18-23 and 29 remain anticipated by Major et al. Specifically, Major et al teach an embodiment using MOCVD that used hydrazine, phenol-hydrazine or metal-organic N sources without pre-cracking and an embodiment that uses MBE wherein the N source is pre-cracked (see Major et al, col. 5, lines 1-11). Applicant argues (top of p. 6 of arguments filed 4/2/03) that Major et al teach that the  $\text{NH}_3$  as the N source is supplied together with  $\text{PH}_3$  and  $\text{AsH}_3$  to generate a disassociation reaction. Applicant alleges that the

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disassociation reaction corresponds to pre-cracking. However, a reasonably broad interpretation of "pre-cracking" would be (for example) that the "cracking" occurs before the  $\text{NH}_3$  enters the processing apparatus. Given such an interpretation, Major et al would anticipate the claimed invention since the "cracking" occurs within the processing apparatus and does not qualify as "pre-cracking". In addition, Major et al teach an embodiment wherein hydrazine is used as the N source and does not require cracking at all (see Major et al, col. 12, lines 23-24 and col. 5, lines 2-3). Further, the Major et al reference indicates that the cracking process is an optional step that is used to provide a greater supply of free N (col. 12, lines 14-22).

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. L. Brophy whose telephone number is (703) 308-6182. The examiner can normally be reached on M-F (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (703) 308-4905. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Q.L.B.

jlb

June 17, 2003

  
AMIR ZARABIAN  
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